Leadership Strategies to Reduce Risks for Nurse Night Shift Workers

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Abstract—**The purpose of this systematic review is to identify leadership strategies to help mitigate risks associated with nurse night shift work. An electronic literature search for "Strategies to reduce risks for nurse night shift workers" was conducted using Pubmed, CINAHL, and Health Source: Nursing/Academic Edition databases. Inclusion criteria used was English language, full text available, and published dates between January 1, 2005 and May 1, 2015. Based on the search criteria a total of 107 articles were identified. Abstracts for the articles were reviewed for relevance and duplicate citations removed for a total of 16 studies being included in the review. Several strategies were identified that helped increase transparency and control of shift scheduling. One idea was the utilization of open-shift management technology to allow staff to volunteer for open shifts within a multi-site healthcare system. This idea fit well with the self-scheduling model. The literature indicated that that level of control over schedule contributed to improved health and sense of well-being for shift workers. The individual factor of hardiness was found to have protective effects for shift work tolerance. Furthermore, specific guidelines for fatigue management and practice guidelines for shift management standards help reduce risk for staff and patients. Education for staff regarding health risks, sleep management, and circadian approaches were addressed as leadership responsibilities. Other shift work strategies that produced positive outcomes focused on the rate, duration, and direction of rotating shifts.**

Keywords—leadership strategies, risks, nurse, night, shift work

I. Introduction

There is a growing amount of literature to indicate that night shift work over time can contribute to significant health risks for nurses. Several studies have been published that support a relationship between nurse night shift work and increased risk of obesity [1, 2, 3], Type II diabetes [1, 4], lung cancer [5], menstrual irregularities [6, 7, 8], stroke [9], fractures [10], hypertension or lack of blood pressure recovery [11, 12], thyroid disease [13], breast cancer [14, 15, 16, 17, 18], irritable bowel syndrome [19], and cardiovascular disease [20]. Chang and others (2014) proposed that rotating night shift too quickly may cause increased anxiety and decreased attention [21].

Nurse night shift work has also been associated with an increased risk of errors and negative patient outcomes. In a randomized clinical trial by Niu and others (2012) of 62 female nurses working full-time in a Taiwan Medical Center, the performance and accuracy of the shift-work group scored significantly less than the day-shift, control group ($p<0.01$). The error rate for night-shift nurses was .44 times more than the day shift nurses ($p<0.001$) [22]. Possible causes for increase error rate during the night shift has been hypothesized as related to fatigue or sleep deprivation. Johnson and others (2014) conducted a cross-sectional survey of 289 nurses who worked full-time night shifts in three urban hospitals. The authors analyzed self-reported data to determine that 56% of the nurses (162) surveyed met criteria for sleep deprivation. The sleep deprived nurses committed a significant amount of more errors than the non-sleep deprived nurses ($p<0.0054$). The authors concluded that an increase of 1 hour of sleep reduced the estimated odds for 1 or more patient errors by 0.255 ($p=0.004$) [23].

Difficulty adjusting sleep cycles to schedule changes has been associated with a condition known as shift work disorder. Shift work disorder is characterized by sleepiness and insomnia, which can be attributed to the person's work schedule [24]. Flow and others (2012) found that 37.6% of 1968 randomly selected Norwegian nurses met the criteria for shift work disorder [24]. Eldevik and others (2013) discovered a significant positive association between quick returns and shift work disorder for 1990 Norwegian nurses. Quick returns was defined as less than 11 hours in between shifts [25]. Furthermore, Asaoka and others (2012) found that shift work disorder was present in 24.4% of the 1202 Tokyo nurses who participated in a questionnaire survey. The authors reported that the nurses with shift work disorder

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experienced more depressive symptoms, spent more time working at night, and had greater rates of both actual accidents/errors and near misses than the nurses who did not meet criteria for shift work disorder [26].

Another characteristics that has been associated with nursing errors.is fatigue. Scott and others (2014) conducted a descriptive study utilizing questionnaires from 546 members of the American Association of Critical-Care Nurses. Self-report questionnaires utilized to gather information on work-related data, sleep quality/quantity, daytime sleepiness, clinical-decision self-efficacy and decision regret. Decision regret was reported by 157/546 nurses (29%). The nurses who reported decision regret also reported more fatigue, more daytime sleepiness, worse sleep quality and less inter shift recovery than the nurses without decision regret. The highest correlations on the binary logistic regression model with decision regret were working 12-hour shifts ($p=0.01$) and low levels of clinical decision satisfaction ($p<0.001$). The authors also identified being male ($p=0.02$) as associated with decision regret, but since only 2 males participated in the study, the confidence placed to generalize is extremely small [27].

Furthermore, Baker and Nussbaum (2011) investigated the concept of fatigue as measured by 5 combined instruments on the perception of nurse performance for 745 registered nurses. They discovered that all fatigue dimensions and states were negatively correlated with perceived performance except the "Five Rights" of medication administrations which was not correlated with physical discomfort or physical exertion [28]. The authors suggested that performance guidelines that specifically govern clinical practice may help to mitigate negative associations between perceived performance and fatigue [28]. Are there other factors that make help to mitigate the risk of errors for nurses?

Admi and others (2008) conducted a descriptive study utilizing a self-administered questionnaire of 688 Israeli nurses. The investigators discovered that shift work nurses complained more about difficulties falling asleep ($p<0.04$), headaches on awakening ($p<0.05$), morning sleepiness ($p<0.0001$), and excessive daytime sleepiness ($p<0.02$) as compared to the day-shift nurses. The authors further investigated the relationship between 336 nurses who adapted to night shift work and 125 non-adaptive nurses based on a sleep questionnaire. Although some of the nurses experienced more sleep-related symptoms that might decrease performance, there were no significant difference in number of clinical errors between the two groups [29].

What are the factors that separate the nurses who experience health issues and make errors during the night shift from the nurses who seem to successfully navigate the night shift challenges without any signs of negative outcomes? This systematic review seeks to explore strategies, characteristics, and ideas that may help reduce risk associated with night work. Are there leadership strategies that have demonstrated effectiveness in reducing the risks associated with nurse night shift work?

II. Method

An electronic literature search for "Strategies to reduce risks for nurse shift workers" was conducted using the Pubmed, CINAHL and Health Source: Nursing/Academic Edition databases. Inclusion criteria included English language, human studies, full text available articles, and published dates between January 1, 2005 and May 1, 2015. Based on the search criteria a total of 107 articles were identified. Editorials and other opinion articles were not included in review. Abstracts for the identified articles were reviewed for relevance and duplicate citations were removed. Reference lists were also reviewed for relevancy, resulting in a total of 15 studies being included in the systematic review. Although STROBE checklists [30] and PRISMA Checklist [31] were utilized to examine quality of studies, no articles were eliminated based on quality.

III. Analysis

A total of 16 studies met the inclusion criteria for the systematic review. The subjects included nurses from New Zealand, Norway, Japan, Australia, Brazil, Denmark, and the United States. The studies were reviewed and categorized according to level of evidence based on Johns Hopkins Strength of Evidence Hierarchy [32]. Four of the studies were reviews, but did not include basic information on literature search sources or dates, inclusion/exclusion criteria, sample sizes, study designs, analysis, bias, or quality of studies reviewed. These articles simply summarized the results of studies reviewed. The four review articles were assessed as a Level V evidence. One study was found to develop a conceptual model of shift-work tolerance. This study was determined as a Level II evidence. Three of the studies were systematic reviews, one of the studies was a qualitative interview, one study was a re-analysis of data from previous studies, and the other six studies were descriptive design based on survey data. These eleven studies were assessed at Level III evidence. The quality of the Level III studies was found to be good.

A. Individual/Lifestyle Factors

Five articles that examined staff nurse perceptions of shift work experiences were included in the review. These studies sought to discover if there were individual

and lifestyle factors that impacted shiftwork tolerance. Three of these articles focused on middle-aged nurses. An additional systematic review is included regarding the impact of caffeine for preventing injuries and errors in shift workers.

In a qualitative study of 13 shift-working mid-life women, West and others (2009) identified numerous temporalities surrounding the shift work experience [33]. Temporalities referred to "clock time" associated with a particular individual and the constraints of the life they are experiencing. The investigators reported using hermeneutic phenomenology proposed by van Manen was used to illuminate the relationships and meaning. Conversation style interviews were digitally recorded with an average length of 45 minutes. The investigators identified partner, children, professional education, group leisure activity, friends, extended family, elderly parents, and community involvement as temporalities experienced by the mid-life shift workers. The authors described the mid-life nurses as "juggling" these multiple temporalities. The investigators identified multiple sub-themes to include arranging life around shift work, the absence of a social life, reconstruct own worlds, and need for control. Several of these sub-themes focused around the development of a shift roster that would work to help the mid-life nurses juggle the multiple temporalities. The nurses focused on arranging life so that it would minimize effects on their families. The lack of a social life but also impacted their families. The process of trying to reconstruct their worlds as mid-life women was limited by their roles as caretakers for multiple family members. The need for control was directed mainly toward the workplace. The nurses spent time trying to exert control over the arrangements for their work life resulting in a focus on the work roster and anger toward those responsible for the roster. The authors recommended the use of time maps as a method to facilitate staff discussions with the joint goals of developing an understanding and moderating the effects of peer pressure. Furthermore, the facilitation of this mutual understanding might lead to the development of sustainable approaches to shift work for mid-life nurses which prevent them from leaving the work force [33].

West and others (2011) conducted a critical re-analysis of data from two previously studies involving female mid-life Australian nurses [34]. One of the studies involved data collected from a postal survey of 5000 mid-life nurses registered with the Nurses and midwives Board of NSW. A total of 1433 surveys were returned. The survey also included two open-ended questions where participants were asked to list three positive and three negative aspects of shiftwork that they had experienced. The thematic content analysis of the data was conducted on the responses from 273 participants who reported working a rapidly rotating roster. The second study involved a semi-structured interview, previously published by West, of 13 registered nurses aged 42-60 who had significantly engaged in shiftwork over a period of 3 or more years (see previous paragraph). The first theme identified in the critical re-analysis was: "making shiftwork work for me". The shift worker attitude made a difference. They were able to focus on the positive aspects of shift work. The narrative focus was on avoiding physical demands of day-shift work and not being around management staff. The second theme was that shiftwork lifestyle facilitated a more manageable work/life negotiations. Strengths seen in shiftwork was flexibility for husband/partner care, family gatherings, afterschool care children, special school nights, running errands, and caring for parents. The third theme was "an opportunity for shift workers to engage in various activities for their own self-care". The authors argued that the more alone time experienced by shift workers provided an opportunity to care for mind/body needs. Furthermore, the authors concluded that the current "problem-centered" focus of shiftwork research does not address the "real issue" for mid-life nurses which is how to develop and promote shiftwork tolerance. The authors suggest that creative ways of arranging shiftwork are needed to support employee-sovereignty and thus minimize the negative impact of shiftwork. This article implied that it is not the shiftwork that is the issue, but the organization of shiftwork that may cause most of the problems [34].

Clendon and Walker (2013) discovered from their research that some nurses felt it was the scheduling practices of their employer that made the greatest difference in how the nurses coped with shiftwork and their health impact [35]. The investigators evaluated data from an anonymous online survey via email to 5683 New Zealand Nurses Organization members aged 50 years and older during February – March 2012. The 3273 survey responses were analyzed using descriptive statistics and STATSITIC A software. Part of the survey included a modified EQ5D survey to explore health-related quality of life. The EQ5D included measures on usual activities, anxiety/depression, and pain/discomfort. Results indicated no significant difference in Eq5D scores between the shift work and non-shift work groups. The free text responses were grouped thematically using NVIVO 9 software. Respondents noted that they found shiftwork more challenging with age. Many described developing coping mechanisms to manage the impact of shiftwork. Some chose to work in different areas of practice or part-time so they could choose their shift and hours to fit their lifestyle. Self-rostering (self-scheduling) and providing a space for nurses to sleep prior and after shifts were suggested as areas employers could assist nurse shift workers. The authors recommend

addressing rostering practices and providing resources on shift work as useful approaches to retain middle-aged nurses in the workforce [35].

In a cross-sectional questionnaire study of 749 randomly selected Norwegian nurses between November 2008 and May 2010, individual, situational, and lifestyle factors related to shift work tolerance was assessed between new and experienced nurses working nights. A total of 322 nurses had worked night shifts for less than 1 year, so classified as new to night work nurses. A total of 427 nurses had worked night shifts for 6 or more years and were classified as experienced night work nurses. Individual differences were measured using the Depositional Resilience Scale-Revised for hardiness, Diural Scale for morningness, and Circadian Type Inventory for languidity and flexibility. Alcohol consumption measured by Alcohol Use Disorders Identification Test-Consumption. In addition, demographic information in addition to self-reported number of nights worked in last 12 months and number of hours worked per week, were collected via questionnaire. Authors stated that all questionnaires used were validated in previous research. The investigators found that there were no differences in shift work tolerance between the new and experienced nurses. The only variable related to shift work tolerance in both the experienced and new to night shift nurses was the trait of hardiness. For the experienced nurses, flexibility was positively related, but languidity, caffeine consumption, and working extended hours were negatively related to shift work tolerance. On the other hand, morningness was positively related to shift work tolerance for the new to night shift nurses. The authors recommended testing for hardiness in vocational counselling regarding shift work occupations might be helpful. They also encouraged less use of extended work hours and encouraging lower caffeine consumption to reduce fatigue [36].

The opinions on whether caffeine use has negative or positive effects on the night shift worker is mixed. Edwards and others (2010) conducted a systematic review from July 2008 to April 2010 for randomized controlled trials investigating the effects of caffeine on injury, error or cognitive performance in people with jet lag or shift work disorder. A total of 13 trials were included in the review. None of the trials measured injury. Two of the trials measured errors and the remanding trials examined neuropsychological tests to assess cognitive performance. The pooled effect estimates on performance suggests that compared to placebo caffeine improved concept formation, reasoning, memory, orientation, attention, and perception. There were no benefits effects on verbal functioning and language skills. In one study, the investigators found that the caffeine group made significantly less errors than the group that took a nap. Other studies that compared caffeine use to other variables such as napping, bright light, and modafinil found no significant difference. The authors assessed that there was a high risk of bias in the studies related to selective outcome reporting. Furthermore, the authors concluded that caffeine may be an effective intervention for improving performance in shift workers. There is no reason that healthy individuals who already consume caffeine in recommended amounts should not continue with caffeine use improve their alertness [37].

Samaha and others (2007) conducted an exploratory study using a self-completion questionnaire survey with a convenience sample of 111 eldercare shift-worker nurses (98 females and 13 males) in Sydney Australia to examine a relationship among chronic fatigue, psychological variable, lifestyle factors and coping behaviors. Power analysis was conducted to ensure sample size large enough for a .80 power in Pearson's correlation between two variables and a multiple regression analysis of five predictor variables based on a moderate effect size and a significance level of 0.05. Information on construct validity and internal reliability presented on measures for chronic fatigue, Stait-Trait Anxiety Inventory, Profile of Mood States and Locus of Control, Behaviour Scale, Lifestyle Appraisal Questionnaire, and Pittsburgh Quality of Sleep Index. The investigators found that poor sleep quality ($p<0.001$) was the lifestyle factor that most strongly contributed to fatigue. Other factors associated with chronic fatigue included: perceived workload ($p=0.002$), lack of regular exercise ($p<0.001$), lack of recreational activities ($p<0.001$), lack of involvement in relaxation exercise ($p<0.042$), poor diet ($p=0.044$), non-availability of close friends/family ($p=0.003$), major stressful events ($p=0.046$), chronic physical problems ($p<0.001$) and avoidance coping behaviors such as drinking alcohol ($p=0.008$), letting out emotions ($p=0.008$) or avoiding situation ($p=0.011$). The authors recommended that further research should focus on altering work schedules/workload and strategies to improve sleep quality. They suggested that cognitive behavior therapy might be useful to reduce anxiety and mood disturbance. Furthermore, they encouraged promoting education on lifestyle behaviors such as recreation and exercise [38].

B. Sleep

Silva-Costa and others (2011) examined the association between sleep patterns during work nights and recovery from work among 396 female nurses (RNs, aides, assistants) from three public hospitals in Rio de Janeiro, Brazil. The nurses were classified into one of three groups: those who did not sleep during night shifts, those who slept up to 2 hours, and those who slept 2-3

hours. The nurses completed a comprehensive questionnaire between June 2005 and March 2006. The first part of the questionnaire was completed by trained interviewers. The second part of the questionnaire was a self-report to include items concerning the Need for Recovery from Work Scale. The scale had been through three rounds of pre-tests and was evaluated for reliability with a population similar to those used in this study. Previous information on reliability was reported on the scale during the study. The investigators reported that only sleeping for 2-3 hours during the night shift was related to better recovery from worked provided the workers did not undergo high levels of domestic work. Sleeping at work did not guarantee a better recovery among female nursing workers. Sleeping up to 2 hours at work was not related to a better recovery from work regardless of the level of domestic work [39].

In a similar manner, Palermo and others (2015) conducted a cross-sectional epidemiological study involving 1940 nurses from 18 public hospitals in Rio de Janeiro, Brazil to examine the association between length of napping during night shift and recovery after work for nurses. The data was collected between 2010 and 2011. The nurses were divided into three groups: those that slept up to 2 hours, those that slept between 2.1 to 3 hours, and those that slept 3.1 or more hours. The nurses completed self-applied questionnaires. The short version of the Need for Recovery, previously adapted to Brazilian Portuguese was used. Information on internal consistency and efforts to assess appropriateness of instrument were discussed. In data analysis, the authors reported adjusting for confounding variables during multiple logistic regression. The authors did not report level of significance with data analysis in the findings. The reported results indicated the highest after work recovery rates (127%) occurred for nurses who slept 2.1 to 3 hours as compared to nurses who did not sleep during the night shift [40].

Three review studies were identified that examined multiple strategies to include sleep management. Masaya Takahashi (2014) conducted a review regarding shift workers and sleep circadian research [41]. Takeyama and others (2005) examined nighttime nap strategies [42]. Caruso and Hitchcock (2010) reviewed strategies to prevent sleep-related injuries [43]. None of the review articles identified how the articles were selected, inclusion/exclusion criteria, dates for literature search, or describe the methodology used to assess the quality of the articles, but did summarize the findings from several studies. Because of the limited information on sample size, sampling method, or analysis of date, the findings from this review are considered with caution.

Takahashi identified several strategies to mitigate damage from shift work. The strategies to assist with sleep included sleep management, fatigue risk management system, health surveillance, pharmacological and non-pharmacological treatments, and circadian approaches. Circadian approaches focus on exposure to bright light and darkness, or to do a partial alignment to day oriented schedules to improved performance and sleep schedules. Health surveillance is recommended for all shift workers on a regular basis. Japan requires evaluations twice a year for shift workers. Pharmacological treatments focus on promoting alertness while on the job, but are recommended to only be used with caution. Non-pharmacological treatments focus on cognitive behavioral therapy for insomnia. Sleep management relates to protected sleep periods between shifts and the option of napping during the night shifts to reduce melatonin suppression. The final recommendation is the development of a fatigue risk management system formulated largely with sleep and circadian biological evidence. According to the author, the fatigue risk management system should include policies, risk management procedures, reporting system, incident investigations, training/education, sleep disorder management, and internal/external auditing [41].

Furthermore, Takeyama and others (2005) reviewed some previous studies examining the effectiveness of nighttime napping [42]. The investigators reported that nighttime nap studies indicated that naps prevented reduction in alertness, performance and sleepiness. The concept of “anchor sleep” was discussed related to a 4-hour sleep period taking at the same time each day stabilized the circadian rhythms even though the other 4 hour sleep period was irregular. In addition, there was an association between nighttime naps and decreased day-time sleep. Furthermore, individual differences may play an important role in napping. Aging may reduce sleep flexibility. Some individuals may fall asleep easier than others. Individuals have differences in morningness or eveningness chronotype. These differences may affect the timing or effectiveness of napping during the nightshift. The authors concluded that nighttime napping is an effective tool to improve night shift work [42].

Caruso and Hitchcock (2010) also conducted a review to identify strategies for nurses to prevent sleep-related injuries and errors. The authors basically summarized some of the recommendations found in articles. No information on design, methodology, inclusion/exclusion criteria, sample sizes, data analysis, or research quality was included in the article. Strategies suggested to reduce risk include shared nurse and manager responsibility, adopting good sleep practices, allowing sufficient time to get enough sleep, implementation of policies to reduce fatigue, and education regarding factors that increase fatigue [43]. Educational about fatigue factors may include time of

strongest dip in wakefulness (between 2am and 6am), fatigue increases with length of time a person is awake, and longer times on tasks increase amount of fatigue. According to the authors, napping prior to night shift along with consumption of caffeine, and moderate exercise for 30 minutes have been shown to increase alertness. However, consuming simple sugars or intense exercise for long periods tend to increase sleepiness [43]. The authors encourage managers to avoid scheduling backward rotations, avoid a weekly rotation, and extended work hours. Recommendations include make use of naps during shifts, schedule employees to work with others rather than alone, and encourage frequent rest breaks during the shift [43].

Ruggiero and others (2014) conducted a narrative systematic review between 1981 and 2011 on scientific literature regarding improvements in sleepiness and sleep-related performance deficits following planned naps taken during the night work. The authors identified 13 studies (one experimental/randomized control trial, and 12 quasi-experimental) which met their inclusion criteria. Power analysis was only reported for one study sample size. The authors assessed that in most studies the sample size was too small. The investigators reported large amount of heterogeneity among samples, inconsistent methods to evaluate health and sleep disorders, and wide variability in job and employment settings. The overall findings indicate that planned naps during night shifts reduce nocturnal sleepiness and improve sleep-related performance deficits. One group of investigators suggested that sleep inertia, the subjective feeling of grogginess characterized by a decline in motor dexterity immediately following awakening, might have impacted the outcomes from naps. [44].

C. Organizational Interventions

Bambra and others (2008) conducted a systematic review to examine the impact of organizational interventions on health effects of shift workers. The investigators identified 26 studies (20 prospective cohort, 1 controlled trial, and 5 unknown designs) published between October 2005 and November 2006 that met inclusion criteria. Two independent reviewers conducted a quality review on the data. Only 3 of the 26 studies involved medical-related professionals as subjects. No outcomes from these three studies were included in recommendations that may benefit health and work-life balance. Only 6 of the studies stated that they controlled for confounders during their analysis. The sample size for 11 of the 26 studies was 50 or less subjects. The evidence base was assessed as small. The outcomes from the studies were usually self-reported. Although the authors expressed some reservations about the extent and quality of the evidence, they identified three types of interventions from the review that were found to have some benefit on health and work-life balance. The beneficial organizational interventions included: switching from slow to fast rotations, changing from backward to forward rotations and self-scheduling for shifts [45].

The findings from a study by Pryce, Albertsen and Nielson (2006) also found benefits of an organizational self-scheduling shift program. The investigators conducted a controlled before and after study on the effects of an open rota scheduling system implemented in a psychiatric hospital in Denmark based on a range of health and wellbeing outcomes. A total of 177 healthcare workers (control group = 91; intervention group = 86) were randomly assigned in the study. Sixty percent of the participants were nurses with a majority being females (92%). The attrition rate was 5% in control and 7% in intervention group. A participatory approach underpinned the development of the self-scheduling system. The purpose of the intervention was to improve levels of health, wellbeing, job satisfaction and work life balance of nursing staff. The authors developed five single-item measures of work-life balance for this study. No information on validity or reliability were reported for this tool. The measures of health and well-being did have reported validity and reliability data. The intervention group had significantly improved scores on job satisfaction ($p<0.01$), work-life balance ($p<0.01$), social support ($p<0.01$) and sense of community ($p<0.001$). But there were no significant differences between the control and intervention groups over time with respect to the primary health outcomes [46].

According to Kilpatrick and Lavoie-Tremblay (2006), "self-scheduling is defined as a process by which staff nurses on a unit collectively decide and implement a monthly work schedule" [47]. The authors conducted a review on information that health care managers need to know on shiftwork. As with the previous reviews, no information on sample size, design, analysis, or quality measures is included on studies discussed in article. The authors suggest that flexibility and control to fit personal circumstances and number of consecutive shifts worked are important considerations in schedules. Individual characteristics such as personal habits, regular exercise, sleep, and diet can have positive or negative effects on work performance. The authors recommend education on individual strategies to improve shift work coping. Finally, the authors suggest organizational interventions such as nighttime napping and self-scheduling as strategies to manage shiftwork more effectively [47].

D. Conceptual Model

Pisarski and others (2006) proposed a model of shift-work tolerance [48]. The investigators utilized survey data from 1257 nurses to conduct structural

equation modeling to include chi-square test goodness to fit indices, analysis of residuals, the Lagrange Multiplier and Wald Tests in order to examine effects of team climate, control over working environment on time-based work/life conflict, physical symptoms, job satisfaction, turnover intention, team identity, and supervisor and colleague support. The intent of this study was to address some of the issues by expanding on the Shift-work Intervention model developed by Pisarski and Bohle (2001). The authors incorporated the following items into the original model: turnover intension, job satisfaction, team identity, and team climate. The authors support with research the rationale for each item to be included in the conceptual model. Measures were identified and cited in previous studies for job satisfaction, physical health symptoms, time-based work/life conflict, team climate, work environment control, social support, team identity, psychological well-being, turnover intention, and negative affect. The authors reported that the analysis of the proposed model revealed a good fit. The final model explained 48% of the variance in turnover intention. The authors reported moderate to high Cronbach's alpha. Furthermore, any dropping or adding of any paths would not lead to any significant increases in the fit of the model based upon Wald and Lagrange multiplier tests. The authors concluded that nurses who perceived higher level of time-based work/life conflict tended to have increased levels of physical symptoms and lower levels of psychological well-being. There was also a direct positive link between both supervisor/co-worker support and control and levels of psychological well-being. These nurses reported more positive team climates, identified more strongly with their teams, and a lower appraisals of their time-based work/life conflict. The turnover intension was lower and the job satisfaction was higher. It was noted that the type of shift schedule worked by the nurses influenced levels of turnover intention, control over work environment, time based work/life conflict, and physical symptoms. The highest levels of time-based work/life conflict and turnover intention was experienced by nurses working extended shifts or rotations involving nights. Shift schedule did not influence job satisfaction, team identity/climate, supervisor/co-worker support or psychological well-being. [48].

IV. Synthesis of findings

Several strategies were gleaned from the systematic review of 16 studies. Leaders should look at individual characteristics such as age [33], developmental tasks [33], heartiness [36], and circadian rhythms [41] when assigning night shift rotations. There are specific developmental tasks that are accomplished during the life cycle. The middle age nurses may have even more challenges as they seek to care for aging parents, teenage children, and own healthcare needs [35]. A schedule that provides more choice and flexibility may work better for this age group [34]. This flexible schedule promotes more of a sense of control and allows the nurses an opportunity to promote a better work/life balance [35]. Utilizing split shifts and part-time options for midlife nurses experiencing multiple family stressors might actually keep these experienced nurses in the work force [33]. Heartiness and flexibility have been found to be a characteristic that promotes resiliency in night shift workers [36]. Nurses with these characteristics may adapt better to rotating night shift. Some nurses naturally have a circadian rhythm that enables them to be more awake late night versus early morning. This characteristic might make them more likely to adjust to the night shift environment.

Leaders can also implement scheduling strategies to reduce the stress for nurses, improve predictability, and promote improved morale. One of the strategies promoted by the literature is the idea of self-scheduling which enables nurses to arrange their work schedule to complement their obligations in their personal and family lives [47]. Another leadership strategy is to promote napping opportunities, so that nurses can utilize their break times for a power nap [45, 47]. Strategic napping improved attention span, wakefulness and relieved tiredness [43]. A final strategy was to educate nurses regarding the hazards of sleep deprivation, life style strategies to promote wellness, and collaboration with leadership on mitigating risks. Life style strategies promoted were moderate use of caffeine [37], ensuring uninterrupted sleep, napping prior to shift work, moderate exercise of about 30 minutes prior to shift work, avoiding sugary foods during shift work, and avoiding excessive alcohol use [43].

Organizational leadership strategies might include the utilization of a shift work tolerance model [48], the implementation of a fatigue risk management system, and development of a scheduling policy limits hours worked per week and prevents rapid or backward rotations [45]. Organizational structure should promote an environment of shared responsibility and accountability between the supervisors and the staff nurses. The positive supportive environment was demonstrated to improve not only the unit morale, but also the well-being of the staff nurses [47]. Patient safety is every nurse's responsibility. The promotion of this team approach to mitigating patient care risk associated with night shift work is advised.

V. Discussion

Sleep deprivation has been associated with reduced attention span, increased errors, and accidents.

Shift work can impact quality of life, psychological and physical health, family relationships, alertness, circadian rhythms and work performance. Some of the qualities identified for nurses who seem to develop more of a shiftwork tolerance and less fatigue include heartiness [47], flexibility [34], work/life balance [46], sense of control [47], and an attitude that makes the best of shiftwork [34]. Middle aged nurses were described as juggling their multiple work/life activities [33]. Organizations are encouraged to create programs that educate nurses regarding negative health risks associated with night shift work and positive coping skills related to diet, exercise, sleep hygiene, and anti-fatigue. Sugary foods were found to increase sleepiness and fatigue. Moderate exercise for 30 minutes prior to night shift was found to increase alertness. A short nap and caffeine consumption prior to night shift was found to decrease sleepiness and increase alertness. Napping on the night shift was considered a positive organizational strategy to decrease incidents of sleep deprivation [42,43,44]. Other positive organizational factors included supervisory support, forward shift rotations [46], limiting extended work hours, flexibility [34], and self-scheduling [46,47]. Self-scheduling increases the sense of control and helps the nurses manage their work/life balance.

The concept of self-scheduling has been around at least since the 1960s, but did not become popular until the 1980s [43]. One non-research article was found during the literature review that supported the concept of self-scheduling as a strategy to improve 24 hour shift coverage and shift staffing. Valentine, Hughes, Nash and Douglas (2008) reported outcomes from the implementing a shared decision-making approach to open-shift management at the Main Line Health system with 3 acute care hospitals in Pennsylvania [49]. The hospital system invested in the "Software-as-a Service" model where vendors manage the system and staff access the system remotely via the Internet. The automated open-shift management technologic provided the infrastructure and tools to create a centralized system to identify open shifts across the system and allow nursing staff to choose shifts they would like to cover. The shift visibility was based on the individual's qualifications to ensure appropriate resources matched to open-shift requirements. The nurse managers had the flexibility to decide the best type of incentive pay to offer given the difficulty of filling a particular shift. The authors reported the following outcomes from the first 18 months of implementation of the automated open-shift management system: a cost savings of $885,299 in a reduction in salary expense, managers saving up to 4-5 hours per week on open shift-related activities for $1,156,097 productive costs per hour savings, nurse retention at an all-time high with turnover rates down from 14.2% to 10.9%, and nurse vacancies decreased from 6.6% to 4.87% [49].

Another organizational recommendation was to develop a fatigue management system. The ANA (2014) has published a position statement on nurse responsibility regarding fatigue [50]. The ANA recommends that nurses and employers follow recommended evidence-based steps to enhance performance and safety. Some suggestions include: nurses should work no more than 40 hours in a 7-day period; employers should stop using mandatory overtime as staffing solution, and schedules should be regular and predictable [50].

Birmingham and others (2013) described the development and implementation of a fatigue management policy at Midland Memorial Hospital in Texas [51]. The identified purpose of the fatigue management policy was to recognize and manage the consequences of sleep deprivation and sustained work hours on patient outcomes and staff. The guidelines limited patient caregivers to no more than 12.5 consecutive hours within 24 hours, no more than 3 consecutive 12-hour shifts, and no more than 60 hours during 7 days. The guidelines addressed sleep cycles, breaks, and uninterrupted periods of time away from work. In addition supervisors were reminded of their responsibility to monitor staff fatigue and take action to help reduce impact. Furthermore, staff were encouraged to uphold their ethical responsibility to patients by arriving at work adequately rested. The author reported that 3 years later, there was only rare occurrences where the guideline parameters were not followed. The authors did not report any data on patient outcomes [51].

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